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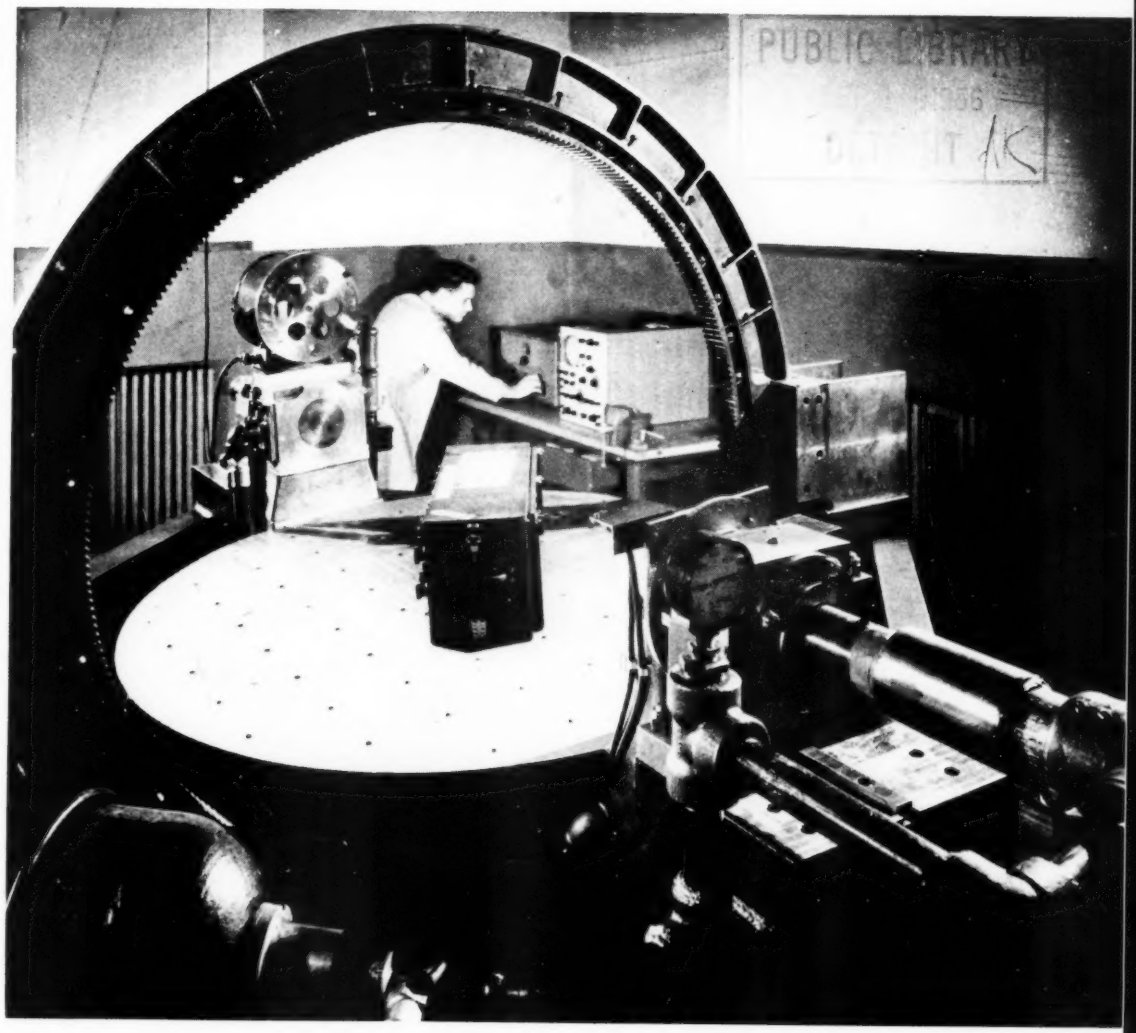
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IMPACT OF THE NATIONAL ROAD PROGRAM—PAGE THREE

Vol. 9 AUGUST, 1956 No. 3

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84 E. RANDOLPH STREET
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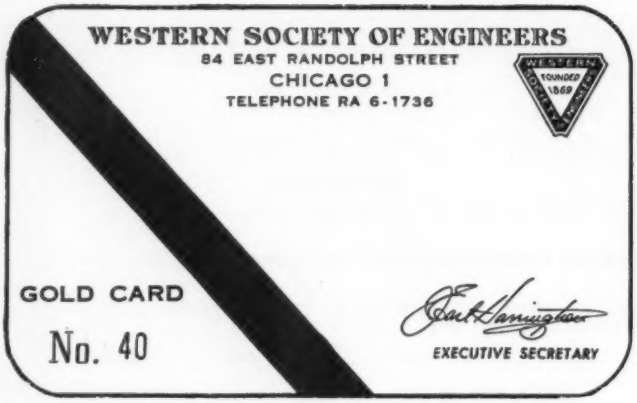

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Impact of

The National Road Program

By John H. O'Brien

When the Pharaohs built their great pyramids the economic impact was felt throughout the valley of the Nile.

When the 48 State highway departments start construction of the national system of interstate highways the economic impact will be felt across a continent.

When the Egyptian projects were completed the rulers had their Pyramids, but when the road builders are through the American people will have 40,000 miles of superb highways, coast to coast, border to border.

No matter on what terms the highway program is described, it is the greatest public works project ever undertaken by a Nation in recorded history.

It involves more area, more people, more materials, and more money.

The construction of the Panama Canal, the pride of our grandparents, and the work on the St. Lawrence Seaway could be fitted into the highway program with ease.

There is, actually, nothing in history with which it can be compared.

The great roads of the conquering Romans would be only a drop in the statistical bucket.

Only during World War II was the United States faced with any comparable expenditures. And war expenditures are economic waste.

The highway expenditures are capital investments in the economic welfare of the nation.

The benefits will flow to all of us, even those of us who do not own or drive motor vehicles.

In fact, the weight of the evidence shows that a continuing lack of adequate highways will slow down the wheels of American commerce to the detriment of us all.

What is our highway system and why is its improvement so vital to us all?

The Federal program contemplates increased spending on all types of Federal-aid highways—secondary, or farm-to-market county roads; primary, or main State routes; urban, or main routes connecting State roads through cities; and the interstate system, or those routes through all 48 States that carry the great bulk of traffic.

The Roman roads all led to Rome, but the interstate system will connect all 48 States. It will connect all but 23 of the 232 cities that have populations of 50,000 or more.

The routes were selected by the 48 State highway departments in cooperation with the U. S. Bureau of Public Roads.

The interstate system will be built to the highest standards that engineers now can devise.

Except in those sparsely-populated areas where the very highest standards are not needed, the system will contain no crossings at grade.

There will be no stop lights or stop signs.

Entrance and exit to the system will be planned in the interest of the motorist using the system.

Commercial establishments, with their frequent driveways, signs, and other traffic-interferers will not be permitted.

The roads will be two, four, six, or eight lanes wide, depending upon the contemplated traffic for years to come.

The rights-of-way will be wide enough from the beginning to add lanes in future years when they may be needed.

The system will provide several cross-continental routes, but its greatest value to many motorists will be in and round our cities, where congestion has been slowly cutting down on the mobility of the automobile.

Main routes will no longer stop at the city limits, dumping traffic onto inadequate city streets.

The interstate system will be just that—a system of carrying heavy traffic almost anywhere it wants to travel in the United States.

Raw Materials Needed

The Federal highway program will require 5,200,000 tons of steel in a single year of construction.

It will require 112,000,000 barrels of cement in its third year.

It will require 908,000 traffic signs in a single year.

It will require at least 5,000,000 gallons of paint per year.

These are only a few of the statistics of the material requirements of the program.

In human needs, it is estimated that the labor force actually at work on the roads will rise from its present 220,000 to some 350,000 by 1958. By 1961 this figure will have grown to 500,000.

Thus within the next four years, 270,000 jobs will have been created.

These are all "on the highway" jobs.

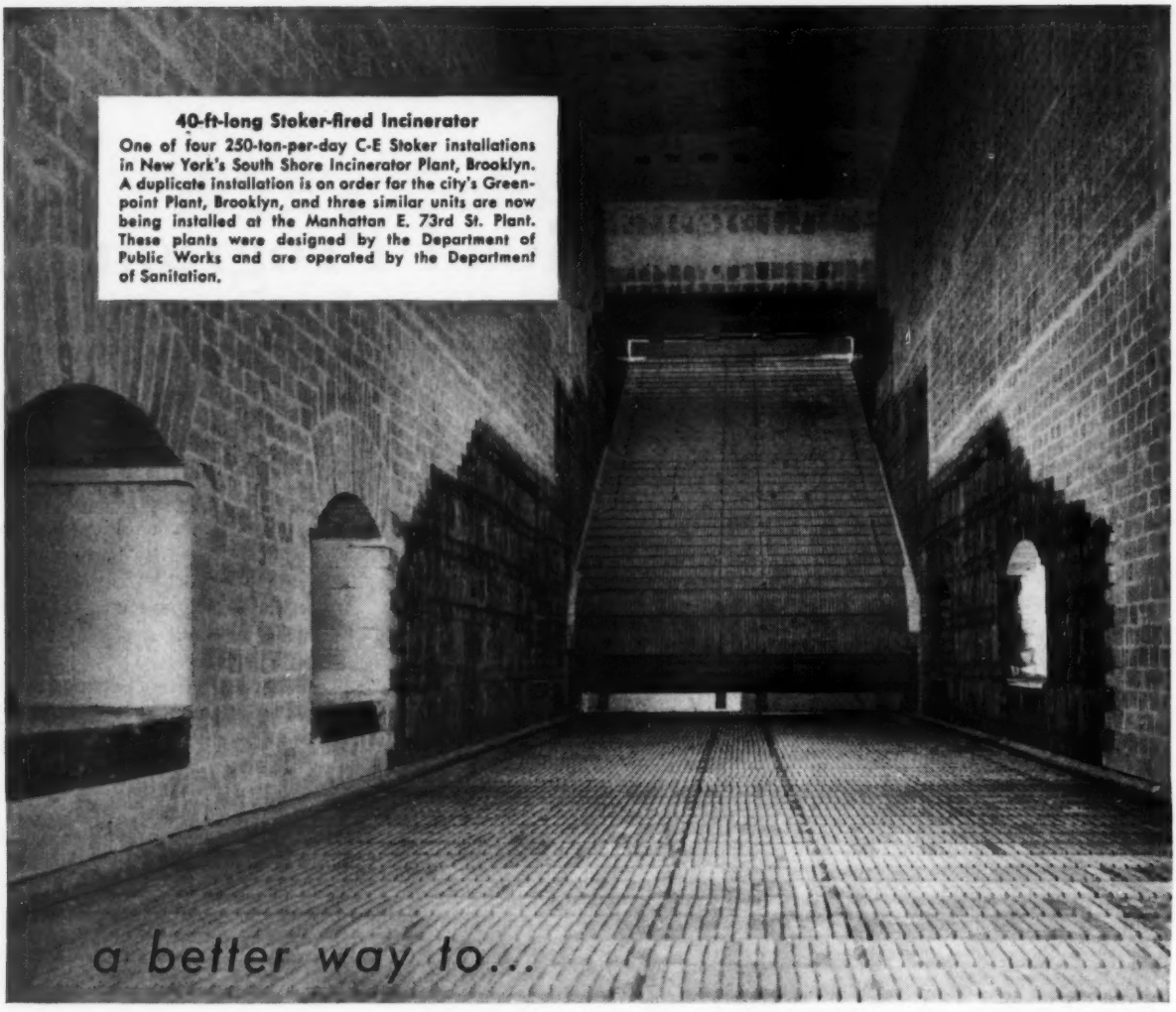
There are no available statistics as to the number of added workers that will be needed in steel and cement plants, earth-moving machinery plants, quarries, and other material-supplying facilities, but the number can be assumed to be substantial.

What about other industries?

The roads now use about 50,000,000 barrels of asphalt annually, five-eighths of the total production.

The asphalt industry can expand read-

This article by Mr. O'Brien, a highly esteemed reporter for the Hearst papers, is reprinted from the June, 1956 issue of ROAD BUILDER'S NEWS.



40-ft-long Stoker-fired Incinerator
One of four 250-ton-per-day C-E Stoker installations in New York's South Shore Incinerator Plant, Brooklyn. A duplicate installation is on order for the city's Greenpoint Plant, Brooklyn, and three similar units are now being installed at the Manhattan E. 73rd St. Plant. These plants were designed by the Department of Public Works and are operated by the Department of Sanitation.

GET RID OF REFUSE

REFUSE — its a big problem for cities and for industries, too. Usually, the best way to get rid of it is to burn it. That's what New York City does — using enormous stokers like the two shown in the incinerator furnace above, which can burn nearly two hundred and fifty tons of garbage and all kinds of refuse a day.

Four C-E stoker-fired incinerators like this went to work in the vast New York refuse disposal system two years ago. Since then, seven similar units have been ordered.

These stokers are specially designed to meet a special problem. But stoker units like this can burn mountains of *industrial* wastes, too. Moreover, combined with a waste heat boiler, they can be used to generate steam for space heating or process work.

Other "waste" materials are also handled at a profit in C-E equipment. Bagasse — sugar cane refuse — is a thoroughly practical fuel, when it's burned in a specially-designed C-E Stoker-Boiler unit. Bark and wood chips, too, are more valuable fuels — now that Combustion has designed equipment to utilize them efficiently.

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ily and it will have to, because the Federal program does not neglect county roads and 85 per cent of our improved county roads use asphalt.

The aggregates industry—the suppliers of stone, sand, gravel, slag and other products—provided 357,000,000 tons of material for highway construction in 1954.

The industry believes it can increase production some 40 per cent with existing plants but when construction reaches its peak it will need an additional 560 portable plants or other equivalent in large, stationary plants.

The manufacturers of highway construction equipment can see a rise in sales of from 150 per cent to 200 per cent when peak demand is reached.

Long Term Investment

A contractor who can depend upon 13 years of construction work is much more likely to invest his captial in new equipment and amortize it over the life of the program.

It is also expected to make the highway field more attractive to student engineers.

Contemplation of the job that will soon confront them has forced State highway departments into research.

They are busy today testing scientific tools such as electronic computers so that man-hours can be saved at the drafting boards.

Thus while most of the economic impact of the highway program is in the future, actually it is with us now in the minds and efforts of many engineers and businessmen.

Other Industries Gain

There are other industries that will benefit from highway construction.

Thus suppliers of timber piling will have to produce 2,823,000 more feet per year than they do now.

There will be few if any steep grades on the interstate system and that means blasting away at rock formations that stand in the way of the road. So 18,345,000 additional pounds of explosives will be needed annually.

The same story can be told about everything that goes into road building.

Fortunately, the industries involved have a breathing spell in which to provide for the expanding needs since the early years of the program call for planning, scheduling, and securing rights-of-way.

So far the economic benefits described have all accrued to those businesses and industries directly concerned with highway construction, either as road contractors, or material suppliers, or manufacturers of machinery and equipment.

Now let's look at the economic impact on others.

For example, a motorist who drives on roads planned for the Federal highway program will save an average of $90 a year in car operating cost.

The experts estimate that an adequate road will save at least one cent per mile in travel expense.

Thus a motorist who drives 9,000 miles per year will save $90.

This is not all clear profit, however, because the added taxes on gasoline and tires to pay for the roads will cost him about $7 per year.

His profit, then, will be $83 per year. But this leaves out other factors.

For instance, construction of the interstate system to modern standards is expected to save 3,500 lives per year and, of course, there will be thousands fewer injured and property damage will be substantially reduced.

When this occurs, it is reasonable to expect auto insurance premium rates to fall.

If the annual premium is reduced by $7 the motorist will be saved the entire cost to him of the added Federal taxes needed to pay for the new roads.

Cost of Poor Roads

The one-cent-per-mile added cost of driving on inadequate roads costs motorists something like $5,300,000,000.

This figure does not include the cost to the whole Nation of high truck shipping rates due to congestion.

Nearly everything we produce travels on a truck at one time or another and even a slight savings per mile of truck operating costs will represent an enormous economic gain for all of us.

It is difficult to put a cost figure on the death or injury of an American man, woman, or child killed in traffic.

Traffic Casualties

One figure that is used puts the average economic loss per fatality at $85,000.

Thus if we were able to reduce our traffic deaths a mere ten per cent we would be avoiding an economic drain of $323,000,000.

We killed more than 38,000 Americans on our roads last year and unless the 1956 rate drops substantially in the remaining months of the year we will kill 42,000 this year.

(Continued on Page 14)

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Study Reports on Soviet Education

The Soviet educational system has trained a small but elite corps of aeronautical scientists who are second to none, according to a pioneering Massachusetts Institute of Technology study of Soviet education in aeronautics.

"These top scientists," said the M.I.T. report, which was prepared by Dr. Trilling, assistant professor of aeronautical engineering at M.I.T., "acting as small flexible task forces, have solved a number of theoretical questions . . . selected to keep Soviet aeronautical science abreast of any competitor."

But, added the M.I.T. report, the Russian technical leaders are perched on a shaky engineering base.

"The full cross section of engineers in the Soviet Union," says Dr. Trilling, "have apparently not yet acquired that degree of engineering 'feeling' which only broad familiarity with machinery can bring. They work by the book and require detailed direction.

"For this reason, excellent designs must frequently be adapted to inferior execution, and tooling or high-grade workmanship is reserved for only key parts of the assembly."

The M.I.T. report also gave special emphasis to the Soviet doctrine that education trains skilled technical personnel for the service of the state.

"The constant subordination of the individual to the national plan," said Dr. Trilling, "is an important psychological influence on professional people in the Soviet Union."

Dr. Trilling also noted that aeronautical engineering receives special attention in the Soviet and quite possibly illustrates their best efforts. Nonetheless, he added, many of the strengths and weaknesses of Soviet aeronautical education are probably representative of other areas.

The Trilling study was prepared by M.I.T.'s Center for International Studies and is part of a broad examination of the qualitative aspects of Soviet technical education being conducted by the Center under a government contract and a grant from the Carnegie Corporation of New York.

This first report was based on official and technical Soviet publications and on the testimony of witnesses, both Westerners who had visited Russia for various lengths of time and former Soviet citizens who either studied or taught in the Soviet Union within the last ten years.

"On the basis of the evidence," said Dr. Trilling, "it is our conclusion that there exists in the Soviet Union a group of talented people with drive and ambition who are generally permitted to reach the top, sometimes quite rapidly, and that their number has increased as a direct result of Soviet educational policy.

"But there are still only a few men who carry the Soviet engineering apparatus on their shoulders, being simultaneously teachers, scientists, and designers.

"There can be little doubt that the ability and knowledge of this key nucleus is on a par with that of the best men in similar positions anywhere, but that at the present time these men do not have adequate support," that is, the technical support of a well-balanced body of engineers and technicians.

The Trilling study was the first to examine in close detail the qualitive aspects of a single segment of Soviet technical training. It was the first to base its conclusions on the pattern of "vertical integration" which is typical of technical training in Russia.

Vertical integration means that in general the segments of Soviet professional programs are defined by the industrial monopolies.

This is the opposite of the familiar "horizontal" pattern of subject matter divisions found in the United States.

In this country, for instance, a man trained as an electrical engineer has a wide range of employment opportunities.

He may seek a job with a firm manufacturing electric appliances, or with a telephone company to improve the efficiency of communication networks, or with an aircraft builder to design automatic control or radio equipment.

This is the horizontal approach to engineering education. It stresses versatility and fundamentals. This horizontal approach requires institutions which are independent of productive facilities.

In the Soviet Union the situation is altogether different. Responsibility for the productive activity of the nation is divided among a small number of powerful ministries, each of which has full charge of a definite segment of the industrial economy.

Each ministry is responsible for many services and much auxiliary equipment needed in its main task: housing in newly developed areas, factory construction, light and specialized tooling, con-

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trol equipment, safety equipment.

In particular, each ministry trains in its own institutes the skilled personnel —engineers, economists, and others— necessary for its operation. This is vertical integration.

Dr. Trilling analyzes this vertical integration in his study of Soviet education in aeronautics.

He discusses the undergraduate training of engineers generally and of aeronautical engineers in particular. He considers graduate training and research in aeronautics. He analyzes the contributions of research in basic science to the development of aeronautics in the Soviet Union.

Dr. Trilling found that one of the chief weaknesses of the Soviet system is its inevitable duplication.

A mechanical engineer of the Ministry of Aircraft Production, for example, may be trained to design the same valves and piping as one in the Oil Production Ministry without any interchange of information between the two.

Yet the system also permits a flexible use of top technical people within any given ministry. Key men carry a variety of responsibilities. They lecture at the university, supervise research at the aeronautical institute, serve as consultants to the industry itself.

This "multiple hat" system, as Dr. Trilling calls it, works with apparent effectiveness. The system also permits concentrated and integrated attack on any given problem. It has had its obvious successes.

"Recent press reports," Dr. Trilling noted as an example, "have indicated that the Soviet aircraft industry has produced turbojet engines appreciably more powerful than those in mass production in the United States at the present time.

"While know-how and ideas from German and other sources have helped in this Soviet accomplishment," he added, "they would not have been absorbed and put to effective use so rapidly if native groups had not mastered the fundamentals of the problem independently and prepared a sufficient number of engineers to extend and improve good borrowed ideas in an original and skillful manner."

In spite of the Soviet strength in science and applied science, said Dr. Trilling, their situation appears less favorable in engineering.

"In the sciences," he noted, "there existed a solid pre-Revolution base which required only to be broadened. In engineering the Soviet system started almost from scratch.

"Moreover, the Soviet regime undertook the task of training a large engineering force while at the same time enormously expanding the national industrial machine. Appreciable progress has been made in both directions, but much remains to be done to create a technical base comparable in engineering instinct to the American or German base."

The number of graduate students at Soviet technical schools is also uniformly low, ranging from two per cent of the student body at Bauman Technical School in Moscow down to zero at many of the outlying institutions. This contrasts to 38 per cent at the Massachusetts Institute of Technology, and an average of 12 per cent in American technical schools generally.

"The Soviet situation," said Dr. Trilling, "may be the result of a deliberate policy which aims to get engineers into the industrial stream as quickly as possible and to enable the senior professors to educate the best graduates as carefully and thoroughly as possible."

But it also appears, he added, that insufficient contact with mature creative teaching personnel and a strong emphasis on factual knowledge useful for immediate applications in design and manufacture have limited the number of young people who give promise of originality and show an interest in research by taking an advanced degree.

This has resulted, said Dr. Trilling, in the present emphasis on graduate correspondence courses, the financial rewards offered for an advanced degree, and the fact that the scientist is now praised as the prime builder of the Soviet state—a trend that is likely to become stronger.

"Although a long-range Soviet policy of industrial expansion in the future and the training of additional teachers should provide an increasing supply of engineers," concluded the M.I.T. study, "it is doubtful whether they will generate sufficient self-reliance in technical matters without extensive changes in the entire Soviet approach to the problem of education."

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Electronic Data Course to be Held

The first annual comprehensive course on the application of electronic data processing equipment will be held in the Hotel Roosevelt in New York City, Sept. 17-21.

Sponsored by Canning, Sisson and Associates of Los Angeles, and Data Processing Counselors of New York, the 30-hour course is tailored in the interests of management.

Emphasis in the course is on the efficient use of electronic data processing, to insure that management will derive the benefits that electronic systems can produce.

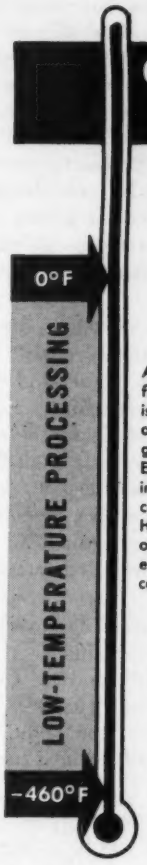
Those who attend the course will require neither any special knowledge of electronics nor any preparation in mathematics.

In the past, courses in electronics have been held by companies to train personnel in the operation of their own machines. The course to be held in September marks the first occasion on which the general principles guiding the planning and use of electronic equipment will be emphasized.

The instructors, Richard G. Canning of Canning, Sisson and Associates, and Felix Kaufman of Data Processing Counselors, have acquired extensive practical experience in Production Control, Inventory Control and the basic accounting functions.

Canning, who is also an associate research engineer at the University of California, previously served as an electronics engineer with IBM and during World War II as an electronic data systems engineer for the U. S. Navy in its work on guided missiles. He wrote the book *Electronic Data Processing For Business and Industry* and also publishes *Data Processing Digest*, a monthly review of articles on electronic data processing.

Kaufman, formerly assistant professor of accounting at the University of Rochester, and applications specialist on the RCA BIZMAC Electronic Data Processing project, has had a great deal of experience in the application of electronics to complex inventory problems. He also initiated the course in Electronic Data Processing at Temple University.



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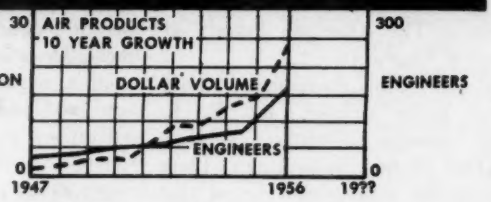

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Power Exhibitors Ready Displays

Exhibitors are rapidly aligning displays for the 22nd National Exposition of Power and Mechanical Engineering, which returns, Nov. 26-30 to New York, to the facilities of the new Coliseum, after a four-year absence. As heretofore, the exposition will be held under the auspices of The American Society of Mechanical Engineers.

Some 250 leading manufacturers have reserved space already, and E. K. Stevens, manager, indicates a substantial influx of new applications. Plans filed with the management reveal that many advances in engineering design, never before available to exposition visitors, are being made ready for release in November, notably such as utilize improved materials, or introduce innovations in instrumentation, automation and testing.

Attractions of Power Show week in New York, aside from the exposition, will include a number of special events. The 76th annual meeting of the ASME will be one. The annual meeting of the American Rocket Society will be another.

Equipment for the production and use of steam will constitute a large proportion of the exhibits at the Coliseum, for the reason that steam is universally employed in power production and in many and varied operations employed by all manner of industries. There will be a comprehensive display of package boilers, as well as components for high-power steam generators, which are individually designed. Steam engines, turbines and turbo-generators will represent the field of prime movers.

Components used in steam generation will include: burners, refractories, insulation, sludge solvents, dust control apparatus, gas scrubbers, tubing, pipe and pipe fittings and supports, flexible and expansion joints, seals and packings, valves and valve controls, traps, pumps, fans and blowers, among others. Many exhibitors will offer equipment and supplies for installation and maintenance of plants, such as packing and gaskets, tube expanders and cleaners, gas analyzers, gages and indicating instruments of many kinds.

The exposition will make news in its newest feature, the atomic section, which is expected to produce striking disclosures among the widening applications of nuclear physics. One display will show a model of the first privately financed critical facility and also an environmental test capsule, said to be the only one available which controls temperature accurately in reactor environment. There will also be research reactor models, a gas turbine for atomic plant use, and material relating to various operations in the application of atomic energy.

Electrical equipment will be strongly represented, not only in power units, such as a variety of motors and motor drives, but in supplementary applications in factory and field. There will be displays of cable testers, dielectric testing and cable fault locating equipment, ac-dc converters, frequency changers and testing equipment, variable speed drives, diesel generating sets, and others.

The newest equipment for overpotential testing will be exhibited. A large public utility recently purchased a set of this equipment and afterward testified that in one test, the saving over previous methods had justified the cost, which was $30,000.

A new addition to an extensive line of power equipment will be a frequency monitor for opening or closing an electrical contact when the frequency in a power line reaches a preset limit, thus signalling for the proper corrective steps to bring the system back to normal. The new unit may also be used as a low/high frequency alarm for generators, and — in conjunction with an electric tachometer generator — as an overspeed alarm and limiter for turbines and other machinery.

Quite outside this same exhibitor's established line is a unique thickness gage, of fountain-pen proportions, which measures the thickness of non-magnetic coatings on cast iron and low-alloy steels. This pocket-sized instrument indicates, by means of a tiny spring balance, the pull required to detach the magnetic head from the test material; the pull varying with the thickness of the coating.

Electrically powered equipment for efficient automation will be offered in a compact, variable speed drive having wide range and fine regulation. At the same display will be shown a motor-generator set with ac and dc controls, mounted in a pressurized, self-ventilating steel cabinet.

In the field of materials there will be, among other exhibits, new varieties in clad steels and many new special purpose alloys, self-lubricating bearings and powder metal parts, metalizing equipment, metal cutting tools, spring coilers

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and torque testers, welding rods and equipment, protective coatings.

A well-known manufacturer of centrifugal castings will exhibit for the first time ductile iron and ductile Ni-Resist in centrifugal cast form.

An accumulation of data by another exhibitor will reveal improvements in the solidity and concentricity of condenser tubes, effected through the application of Magnaflux testing. Condenser tube manufacture will be demonstrated through the operation of a miniature draw bench.

A new line of duct is composed of fiberglass impregnated with neoprene or silicone, and reinforced with wire. It is capable of withstanding temperatures from —65 to +600F. Produced in a range of 1 in. to 12 in. I D, it is widely used in aircraft applications, as well as industrial uses.

An entirely new expansion joint has been designed to eliminate the use of highly stressed, thin-wall corrugated bellows in piping systems. It accommodates traverse expansion and misalignment. and is valued as a safeguard against damage where piping is subject to vibration and shock, or where settling or earthquake hazards are anticipated.

Termed the first hydraulic bolt tentioner, providing the fastest method for securing uniform pressure control on gaskets, will also be exhibited for the first time.

Water saving in industrial cooling, with temperature controlled to within 2 deg F, is offered in the new Panel Casing Aero Heat Exchanger, an evaporation apparatus which maintains the required thermal level by the modulated use of outdoor air. The system is available in four capacities—7,000,000 to 18,000,000 Btu/hr—and is designed for convenient outdoor ground or roof location adjacent to the point of distribution. Among the many uses for such a system are temperature control of quench baths, lubricating and cutting oils, wire-drawing compounds, hydraulic press oils, degreasers, transformers, electronic sets and, in the chemical process industries, cooling of reactions, evaporating, distilling and condensing.

One of the most novel displays at the exposition will be the Guide-O-Matic industrial tractor, which safely threads the aisles of an industrial plant with several trailer loads of material in tow, without an operator at the steering wheel. Control of the train is effected by electronic signals, communicated to a receiver on the tractor from a guidance wire, which may be embedded in the floor, laid on the floor under a protective tape, or strung overhead. The tractor operates at 3 to 6 miles per hour, and is equipped with hand controls, for conventional battery-operated tractor operation when required.

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Needed; "Bench" Of Replacements

Top management in construction needs a "bench" of replacements. Both educators and contractors are at work on the problem of how to provide special college training for future administrators of the construction industry, *Engineering News-Record* says.

One estimate puts 42 per cent of present construction executives within ten years of the 65-year retirement age. And with a total output of only 4,400 civil engineers this June, another survey indicates the construction field needs about 13,000 young engineering graduates during the next three years and 20,000 during the next five years.

From the contractors' viewpoint, a civil engineer is not properly educated for the involved task of becoming a successful administrator of construction. He must also be a good businessman and have special training in economics, banking and labor relations, the magazine points out.

From the educators' standpoint, the difficulty is to rearrange the educational framework to prepare students for construction. Educators believe that courses should be basic; that there should be no future splinter courses. Nevertheless, some 36 colleges and universities offer courses for the building industry in 28 states.

The major problem is to sell the usefulness of the idea of construction courses to college faculties and administrative staffs, the magazine says. Possible programs include: a general engineering undergraduate program followed by graduate work in construc-engineering; a civil engineering undergraduate program with an option in construction and specialization in at least the senior year; a construction engineering undergraduate program; a business administration undergraduate program followed by graduate work in construction management; a combined engineering and business administration undergraduate program.

On Talent

Hide not your Talents, they for Use were made: What's a Sun-Dial in the Shade?

—Poor Richard's Almanack

SAY, ENGINEER!

Do you like to DRIVE?

Then why not drive to WSE meetings and other functions? There's plenty of PARKING almost at the door—the Underground Garage is diagonally across the street from WSE Headquarters (see the map below) and two private garages are a block west.

Interior view of Underground Garage

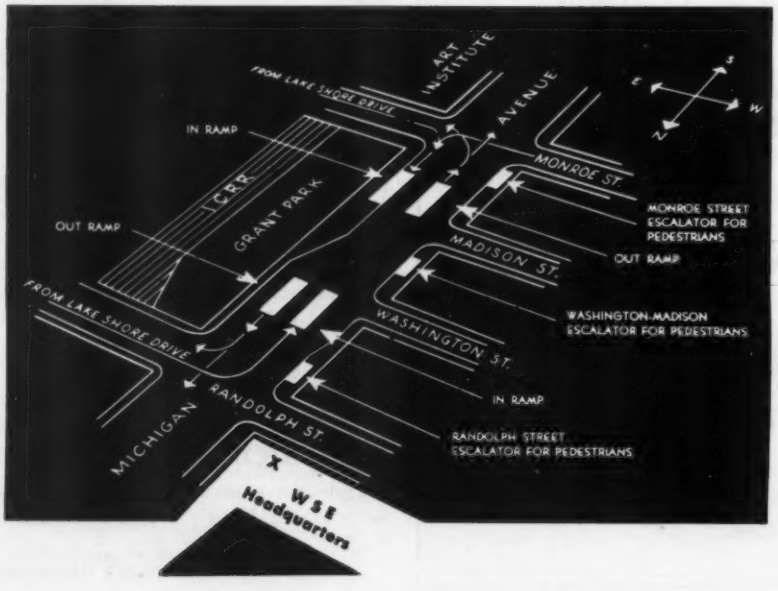
If you're not driving it's still convenient to get to and from WSE meetings.

Here are handy stations or stops:

- The Cab Stand is just across the street
- The Elevated is one block west
- The Subway is two blocks west
- Buses stop at the door or within a few blocks for every part of town
- The IC Suburban station is across the street
- Other suburban stations are conveniently served by bus or elevated.

You see, your WSE Headquarters is at the handiest place in Chicago.

Below: map showing Park Department Underground Garage



ENTER at either Monroe or Randolph Street on Michigan

EASY access, Speedy exit

ESCALATORS convey you to street level

CAPACITY The garage with its 2359 parking spaces, is designed to prevent overcrowding.

NTI Investigates 'Hot' Tracers

Northwestern Technological Institute engineers have launched an investigation into the use of radioactive "tracers" to help solve flame stabilization problems which long have perplexed jet and rocket engineers.

Writing in *Jet Propulsion*, journal of the American Rocket society, the NTI researchers say the new method makes possible "a simple but thorough exploration of the various regions in an aerothermochemical system."

Aerothermochemical systems, such as are encountered in jet and rocket engines, are those in which combustion occurs in high speed gas streams.

Sponsoring the radiotracer study are the gas dynamics laboratory of the mechanical engineering department and the radionuclear laboratory of the civil engineering department at NTI. The investigations are supported by grants from the Atomic Energy commission and NTI.

Principal investigators are Vadim Kopytoff, teaching assistant in mechanical engineering; Carlos G. Bell, Jr., assistant professor of civil engineering, and Ali Bulent Cambel, associate professor of mechanical engineering.

They say the radiotracers can be added directly to the fuel-air mixture in a combustion system or can be used to "tag" individual molecules by replacing a specified atom in the molecule with its radioisotope.

"Basically, the technique consists of injecting a tracer at a desired location in the system, usually before the combustion zone," the NTI engineers say. "Samples of the mixture are collected in previously evacuated bottles and studied with either a spectrometer or internal Geiger-Mueller counter."

Such studies are expected to reveal new information about such phenomena as flow and mixing in various regions of the system.

Either tritium (radiohydrogen) or radiocarbon can be used as tracers, the engineers say. Tritium can be added directly to the fuel-air mixture, and both radiotracers can be employed in molecular "tagging." Radiocarbon is more expensive and more hazardous than tritium but is more easily detectable.

The engineers cite a number of advantages radiotracers offer in flame studies.:

—Extremely small amounts of a tracer can be introduced and detected.

—Tracers make possibe handling and measuring techniques which may make probing and sampling less difficult.

—Specific atoms can be tagged so that they are not affected by physical and chemical reactions in the flame or during sampling.

—Tracers have little chemical effect on the fuel while labeling chosen molecules.

Lady Engineers Headline 20th Clinic

Two of the world's outstanding lady industrial engineers will headline the 20th Anniversary Time and Motion Study and Management Clinic sponsored by the Industrial Management Society to be held at the Hotel Sherman, Oct. 31, Nov. 1 and 2, 1956.

America's Dr. Lillian Gilbreth, so-called "mother" of motion study, and England's Anne G. Shaw, consultant to leading British industries, will discuss "Industrial Engineering: U. S. A. and England" at the Thursday evening banquet.

Leading experts from industry, labor and education will discuss the latest trends in methods, time study, motion economy, materials handling, production control, incentives and plant layout.

The Clinic will feature the winning films of the society's methods improvement competition which has been conducted throughout industry during the past year.

More than 2,000 works managers, production executives and industrial engineers from all parts of the country are expected to attend the three-day Clinic.

Papers on Diamond Tools are Available

The American Society of Tool Engineers has announced availability of a complete set of coordinated technical papers on Shaped Diamond Tools. The lectures were presented at the Industrial Diamond Symposium held in conjunction with the recent 24th Annual Convention of the ASTE in Chicago.

This Symposium, cosponsored by ASTE and Armour Research Foundation, embraces 12 technical papers by world-renowned authorities in the diamond industry. The leatherette-bound library edition presents 120 pages of the latest and most complete information available today on the subject of shaped diamond tools.

The subject is covered in the following coordinated discussions: Man-made diamonds; how diamond crystallography affects the selection, preparation and design of diamond tools; the industrial diamond and thread and form grinding; suggested standards for diamond tools; uses of industrial diamonds in industry —turning, shaping, boring and reaming operations; special uses, and the proper selection of diamonds for industrial use.

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Road Program

(Continued from Page 5)

Another factor difficult to evaluate in money is time.

What is your time worth when you are driving to and from work?

Is your free time worth as much as your per hour wage or salary rate?

Everyone can make his own evaluation.

If the new roads, particularly through metropolitan areas, will reduce your daily work driving time by one-half, what will it mean to you in money?

If it means anything, add that to the economic gains attributable to better roads.

And if you estimate it is worth a mere $7 per year already you have recouped the cost to you of the Federal highway program in new taxes.

Thus the roads you buy with your $7 will return you that sum many times over through lower operating costs, lower premium rate, and time saved.

And if you do not own a car and therefore do not pay any tax at all for better roads, you will make a clear gain in whatever reduction occurs in truck shipping rates.

One of the amazing side effects of better roads is the way in which the value of land along them skyrockets.

In four years the price of an acre along the New York Thruway soared from $714 to an astounding $6,000.

The new road has turned that acre from raw, almost useless land into a desirable industrial site.

The whole New York Thruway story reads like an account of the California gold rush.

The area around Syracuse, because of accessibility to the new road, attracted new plants constructed by such industrial giants as General Motors, General Electric, Carrier Corp., Allied Chemical & Dye Corp., and Western Electric.

Near the Thruway traffic interchange there was a piece of property of 23 acres. No water, sewer, or gas facilities were available. It was valued at $100 an acre, before the Thruway.

After the Thruway, in 1955, a machinery company bought the tract for $46,000.

The value had risen from $100 an acre to $2,000.

Attracting Business

Thruway authorities say the road so far has attracted to it $150,000,000 worth of new or expanded industries having an annual payroll of more than $100,000,000.

On the Pacific Coast, along the Northern Sacramento Freeway in California, land sold for $600 an acre in 1947.

Two years after the Freeway opened for traffic the price was $1,100 an acre.

In 1950, the price was $7,100 an acre and a year later it reached $10,000 an acre.

And to drive the point home:

There were no similar land price increases in the Sacramento area not served by the new Freeway.

Economic Growth

Here is how the chairman of the New York State Thruway Authority sums it all up:

"The tremendous toll that outmoded highways exact in lives, property damage, human misery, and sheer economic waste alone compensates for the cost of constructing modern highways against many factors, but paramount among them is the economic growth and development that have become synonymous with new expressways and major highway construction programs.

"We have under-emphasized these benefits, in spite of the fact that they far out-weigh the cost of providing the highways themselves."

These are the main factors of the economic impact of the Federal highway program.

There are scores of other examples.

Let's look at just one—what better roads will mean to the airlines.

Today ground trips from and to airports frequently take more time than the flight itself.

Flight time between Detroit and Cleveland is 44 minutes. Ground transportation time, to and from the two airports, is 80 minutes.

Fight time between San Francisco and Los Angeles is 140 minutes. Ground transportation time: 120 minutes.

Flight time: St. Louis to Chicago: 122 minutes. Ground transportation time: 90 minutes.

Proposed expressways in 59 cities will save an average of 35 per cent of ground transportation time.

So the airlines are interested in better roads and so is just about everybody else.

Better roads do not necessarily guarantee a prosperous America, but can we have the economic expansion upon which prosperity depends if we do not have an adequate highway system?

Here is what the Governors' Conference reported to President Eisenhower:

"An adequate highway system is vital to the continued expansion of the economy.

"The projected figures for gross national product (the value of all our goods and services) will not be realized if the highway plant continues to deteriorate."

Better Roads Soon

This statement, disregarding all others previously given on the economic impact of the federal highway program, would seem to be the clincher.

If we want to prosper we must have better roads.

And we are going to get them.

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Air Conditioning Show Scheduled

Thousands will be attracted to the forthcoming meeting and heating and air-conditioning show in Chicago the week of Feb. 25, 1957.

This is the big show; the 13th International Heating and Air-Conditioning Exposition, under the auspices of the American Society of Heating and Air-Conditioning Engineers, which will be held simultaneously with the 63rd Annual Meeting of the Society.

Registration headquarters and the site of the technical sessions, according to Society President John W. James, MWSE, Chicago, will be the Conrad Hilton. The Exposition will be presented in the International Amphitheater from Feb. 25 to March 1.

General chairman of the Illinois Chapter Committee on Arrangements is Peter J. Marschall, assisted by vice chairman Harry G. Gragg, Illinois Chapter president. Honorary chairmen are society past presidents Harry M. Hart, Samuel R. Lewis, MWSE, and Dr. Arthur C. Willard, Urbana, Ill.

The 63rd Annual Meeting will consist of technical sessions, committee meetings, election and installation of officers. A program of 14 papers and two symposiums has been arranged by the Programs and Papers Committee.

The symposium on Industrial Ventilation, with an outstanding panel of qualified speakers, is being arranged by Professor Charles H. Pesterfield, East Lansing, Mich., and John Everetts, Jr., Philadelphia, Pa., is making plans for a symposium on Dehumidification.

In addition to the reports of the officers and committees, there will be papers presented on a variety of subjects. Several are ASHAE Research Laboratory papers and others are the result of studies at cooperating institutions.

There will be a preliminary report on pulsations in oil-fired and gas-fired heating equipment now being conducted at Battelle Memorial Institute under the joint sponsorship of ASHAE, AGA and OHI.

Another paper is the result of a study of the design of the underground coil when earth is the heat source or sink for a heat pump.

One of the papers included in the program is the second part of a study conducted at the University of Illinois on the effects of floor coverings on floor panel heating.

Those with an interest in cooling towers will want to hear the results of several hundred tests over a period of more than a year on three types of redwood cooling tower packings.

An ASHAE Research Laboratory paper on panel heating as well as a design manual for floor panel heating will be discussed. This is the result of activity since November 1951 by the TAC on Panel Heating and Cooling and the ASHAE Research Laboratory to develop basic information pertaining to panel heating and cooling applications.

How an analogue computer can be used to solve thermal circuits, and a table of outside design temperatures throughout the United States will be topics covered in two other papers.

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- *Dinner — 5:30 p.m.-8 p.m.*

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New Super Alloy Is Developed

Scientists of the Westinghouse Research Laboratories in Pittsburgh, Pa., have unveiled in New York a new super-alloy, one application of which is for high-temperature steam turbine blades. The alloy is the first practical result of a new research technique for "predesigning" metals of the future.

Dr. Clarence Zener, acting director of Westinghouse research, and Dr. A. W. Cochardt, advisory metallurgist at the Westinghouse Research Laboratories, revealed that the new alloy—called Nivco—was deliberately "predesigned" to have high strength at temperatures as high as 1200 degrees F., with the ability to resist mechanical vibration. This ability to kill mechanical vibration, called "damping," results from control of the magnetic arrangement of the atoms comprising the alloy, and was theoretically "built in" before the metal itself was actually prepared.

Dr. Zener said the research technique which produced Westinghouse's new super-alloy is a direct result of the company's long-range materials development program. The technique, he said, permits the "predesign" of a needed set of properties into an alloy, thereby eliminating the time-consuming "cut-and-try" metallurgical methods usually employed. It promises to speed the discovery of other new alloys and insure that those developed will have the best possible properties within the alloying metals available.

The Westinghouse research executive said that the research team which developed the new turbine blade material was headed by Dr. Cochardt.

"Whirling at 3600 revolutions per minute inside the scorching interior of a steam turbine, turbine blades are subject to tremendous steady and varying forces which tend to make them vibrate," Dr. Cochardt declared. "To aid in reducing the amplitude of this vibration, the blades must be artificially damped, or the blade material itself must have self-induced damping so it will minimize vibration and keep the blade within safe limits. At the same time, the metal must retain strength and resistance to corrosion required of all turbine blade materials operating at higher temperatures.

"Present turbine blade materials, such as 12 per cent chrome steel, have excellent over-all properties up to about 1050 degrees Fahrenheit initial temperature. Above that temperature, however, chrome steel must be used at lower stress levels.

"For several years, therefore, we have recognized that improved turbine blade materials would be required by the larger, higher-temperature turbogenerator units now being developed to realize higher thermal efficiencies for the large-scale generation of electricity."

Dr. Cochardt declared that the new alloy promises to be such a material. At 1200 degrees Fahrenheit, he said, Nivco has five times the strength of 12 per cent chrome steel, and a damping nearly equal to chrome steel at 900 degrees.

"The mechanical behavior of a given alloy depends, at least in part, on its magnetic properties," the Westinghouse metallurgist explained. "Now, after several years of research, we have discovered how to design needed mechanical behavior into certain alloys by control of their magnetic structures. This enables us to predict the behavior we will get by combining certain metals in different proportions, and we can do this without preparing and testing hundreds of thousands of potential combinations of two or more alloying metals.

"This technique, we feel, is a major forward step in metallurgical research, and this new alloy the beginning of its application to practical situations.

"Nivco snubs vibration of the turbine blading appreciably simply because its magnetic structure dictates that it cannot vibrate. It is an ability which was consciously 'predesigned' into the metal, and was foreseen well before we saw a piece of the metal itself."

Dr. Cochardt said the new Westinghouse alloy was a three-stage research development.

"In the initial stage we made an exhaustive study of the magnetomechanical effects in metals, including magnetostriction—the tendency for certain metals to change dimensions under the influence of a magnetic field. This research furnished the basic knowledge needed for 'predesigning' our new alloy.

"In the second stage we tested our theories by preparing and analyzing some 50 different alloys, studying in detail their damping, corrosion resistance, hardness, tensile strength and ductility.

"Finally, we perfected the strength and corrosion resistance of the highly damped alloys suggested by our theories and verified by their preparation. The final result was an alloy which we think will prove to be an outstanding blading material for the steam turbine of tomorrow."

Although he did not disclose its exact composition, Dr. Cochardt said that Nivco was composed principally of cobalt and nickel but it included certain smaller amounts of five additional elements. The ultimate tensile strength of the metal, he said, is about 100,000 pounds per square inch at 1200 degrees F., at which temperature the metal glows with a dull red heat. The alloy, he said, is prepared by melting in a vacuum furnace under an inert atmosphere of argon gas. After melting, it is treated and forged at 2000 degrees Fahrenheit.

Dr. Cochardt said that one possible

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Opening of new rights-of-way, and trimming of trees and chemical brush control on existing rights-of-way are operations which should be entrusted only to specialists.

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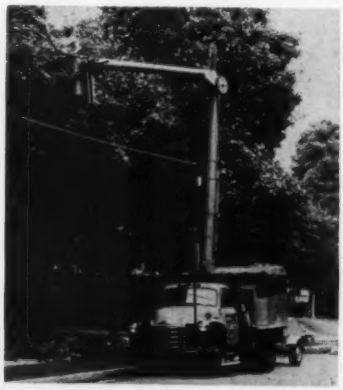

application of the new alloy is in the super-pressure turbogenerator now being built by the Westinghouse steam division in Philadelphia.

"This 325,000-kilowatt turbogenerator will have the highest operating temperature and pressure, as well as the best plant heat rate of any existing or proposed unit for electric utility service," he said.

"The turbine which drives the electric generator will operate at a pressure above the critical pressure of water, meaning that it operates above the pressure at which water changes from a liquid into a gas without going through the vapor phase.

"Our steam engineers tell us that Nivco is a 'natural' for this application," Dr. Cochardt said, "and will help make possible a major forward step in steam turbine design. While we expect that this new material will provide a solution of the problem of suitable turbine blade material for several years to come, we are already seeking even better ones. And we think that the new metallurgical research technique we have developed will be of significant help and bring along the great variety of new metals and alloys which inevitably will be demanded by the bigger, stronger, more efficient equipment of the future."

Heat Process Allows Metal Pre-finishing

Manufacturers of small precision stainless steel parts for instruments and aircraft can now finish machine these parts before heat treating. This is made possible by a heat treating process developed by the Allied Products Division of Hamilton Watch Co., of Lancaster, Pa. This new process permits heat treating even minute stainless parts to any desired degree of hardness or toughness without causing discoloration of their fine finish or any dimensional distortion.

This new heat treating process is effective for all hardenable grades of stainless steel. It will produce both toughness and hardness. Hardness of any desired degree can be obtained with the new process, and the desired degree of hardness can be attained even all the way through the material.

The Allied Products Division's new heat treating process is the outgrowth of Hamilton's development work on heat treating small stainless steel parts used in watches. Stainless is used in many watch parts, particularly in the numerous fastening screws used in each watch to hold the mounting elements (partial and full base plates) together. With the carbon steel screws formerly used as fasteners the screw would often corrode in place and occasionally the screw would be broken in disassembling the watch for cleaning or repair. This would necessitate a difficult job of removing the broken-off screw. Stainless steel screws eliminate this breakage hazard, hence are used extensively by Hamilton in watch manufacture.

The new process is achieved by precise control of the heat treating furnace atmosphere through special preparation of the atmosphere gases. Also, the furnaces are especially designed for gas tightness to prevent entrance of any contaminants to the furnace atmosphere. Where required, the process is carried out in several stages, including a main heat treating step first and even a heat treating step in vacuum later.

A unique feature of this Hamilton heat treating process is that it not only prevents distortion of the minute parts, but can also be arranged to produce controlled amounts of growth or shrinkage in dimensions of the parts. Thus the process has already been used to achieve dimensional restoration of a rejected batch of small, lapped-together stainless steel parts for jet engines to within specified dimensional tolerances.

Even minute parts heat treated by this process are so free of distortion and so clean and bright that the process permits finish machining before heat treating, while the material is still in the soft state. It thus eliminates final machining, also such secondary operations as cleaning and polishing, after the material is hardened.

Miniaturization?

The world's smallest TV camera is designed to locate faults in boiler tubes, says *American Machinist*. German built, the tiny camera is two inches in diameter and six inches long.

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Metal Radiation Damage Studied

Northwestern Technological Institute metallurgists, in a project supported by the Atomic Energy commission, have initiated an investigation into radiation damage to metals.

They are pioneering the study of how high-energy electron bombardments affect the physical properties of such metals as silver, gold, iron, cobalt, and nickel.

Previous radiation damage studies have been concerned mainly with heavy particles. Electron particles permit a greater control over the type of damage produced.

The Northwestern research will employ the university's recently completed Van de Graaff accelerator. The accelerator will be used to fire electrons at small samples of the metals to change their crystalline structures and physical properties. The unit can accelerate electrons with energies as high as 5 million electron volts.

"By studying imperfections produced with some degree of control, we expect to learn much about the relationship between crystalline structure and the physical properties of materials," said Dr. John W. Kauffman, assistant professor of metallurgy.

Dr. Kauffman is directing the research project. Also participating in the studies are Dr. Morris E. Fine, professor and chairman of the department of metallurgy, and Dr. Anthony Kelly, assistant professor of metallurgy. Dr. Fine will be concerned with elastic constant measurements and Dr. Kelly with work on X-ray diffraction.

Changes in crystalline structures will be produced by using high-energy electrons to displace atoms from their normal positions in the structures. Each atom in a crystal is confined to a definite small space between neighboring atoms. The atoms are arranged in a three-dimensional lattice.

The metallurgists will produce and study three types of imperfections in the lattices. One type is the "vacancy" which results when an electron knocks an atom from its normal position. Another type, termed "interstitial," occurs when the displaced atom takes a position in a space between other atoms. A "dislocation spike" is believed to be produced when the bombarded area strikes and displaces other atoms.

Initial investigations will measure threshold energy (the energy required to displace an atom from its normal lattice position) at a temperature 4 degrees centigrade above absolute zero. (Absolute zero is the lowest possible temperature. It corresponds to 459.6 degrees below zero on the Fahrenheit scale.) This extremely low temperature will be produced with liquid helium.

"No threshold energies have been reported at temperatures lower than that of liquid nitrogen, which is about 365 degrees below zero Fahrenheit," Dr. Kauffman said. "A lower energy may be required at the lower temperature, and its value is a fundamental quantity in the theory of radiation damage."

Other experiments are designed to determine the effects of various types of radiation damage on a metal's electrical resistance and elasticity.

Several metals will be used initially in the studies. The noble metals (silver, copper, and gold) will be employed because of their simplicity and the fact that they allow and have been subjected to theoretical calculations. Effects of crystal structure will be studied with iron, cobalt, and nickel because each of these metals has one of the three typical crystal structures.

The principal investigator, Dr. Kauffman, did research on imperfections in solids from 1950 to 1955 at the University of Illinois, where his work was related to that university's program on radiation change.

Dr. Fine currently is directing metal structural change studies in a project sponsored by the Office of Scientific Research Air Research and Development command. Dr. Kelly formerly was a research fellow at the University of Birmingham (England) and research associate at the University of Illinois.

Ordway is Appointed

Hubert Woods, director of research for the Portland Cement Association, has announced the appointment of Dr. Fred D. Ordway, Jr., as director of the PCA Fellowship at the National Bureau of Standards, Washington, D.C., effective July 1. Dr. Ordway has been acting director of the fellowship since 1954, following the retirement of Dr. R. H. Bogue.

The fellowship operates as an integral section of the Research Department of the Portland Cement Association. It employs a staff of scientists in the Washington, D.C., laboratories of the National Bureau of Standards, who are engaged in basic research on the constitution and properties of portland cement. These investigations are coordinated with a widespread research program conducted by the association at its Research and Development laboratories in Skokie, Ill.

Dr. Ordway was born in Kansas City, Mo. He was graduated from public schools in Albany, New York, and received B.S. and M.S. degrees in physical chemistry at Rensselaer Polytechnic Institute. After war research work at the California Institute of Technology, he took the Ph.D. degree there. He joined the Portland Cement Association Fellowship at the National Bureau of Standards in 1948.

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Computer Symposium Scheduled

Problems and experiences with medium-sized electronic computers will be the theme of the third annual Computer Applications Symposium, to be held Oct. 9 and 10 at the Morrison Hotel in Chicago.

The symposium, sponsored annually by Armour Research Foundation of Illinois Institute of Technology, is taking a cue from current trends in computing installations.

The rapid increase in the use of electronic computers, according to Harold H. Kantner, program chairman, is being paced by the medium scale instruments, which are being installed at a rate of better than one each working day.

Kantner, supervisor of ARF's mathematical services section which operates the Foundation's computer center, said the number of medium scale computers, or data processing machines, being ordered or installed this year greatly exceeds the larger, more expensive machines.

"The manufacture of computers in 1955, for the first time, attained substantial volume, with output reported to have been more than had been built up to 1955," he said.

"This means," Kantner added, "business and industry now are entering the applications phase in computer development.

"The symposium program has been arranged in recognition of a heightened interest in the problems and performance of electronic calculators, which came into being only slightly more than a decade ago."

Twelve speakers at the two-day meeting will deal with the utilization of a number of machines in the medium scale, including the IBM 650, Datatron, and others. All speakers will represent organizations in which the instruments are in use.

A broad range of activities will be covered, including the mail order business; petroleum, chemical and aircraft industries; utilities; banking and insurance; heavy and light manufacturing, and educational institutions.

Subjects of special interest will include:

—Problems encountered in installing computers.

—Problems of revising programs to give effect to changes in procedures.

—Use of computers on problems which could not be solved by other methods, as opposed to their use in mechanizing routine procedures, such as payroll.

—Methods of approach and type of personnel required.

The Oct. 9 sessions will be devoted to business and management applications. Speakers the following day will cover engineering and research applications.

Chairman at the business and management applications sessions will be Dr. Alan J. Perlis, director of the computations center at Carnegie Institute of Technology. A widely recognized computer expert, Perlis formerly was head of the computing laboratory at Purdue University.

Dr. John W. Carr III will preside at the engineering and research applications session on Oct. 10. He is an assistant professor of mathematics at the University of Michigan, and consultant at the university's Willow Run Laboratory, where he formerly supervised the computer facility.

Inquiries concerning the symposium should be directed to J. J. Kowal, conference secretary, Armour Research Foundation of Illinois Institute of Technology, 10 W. 35th St., Chicago 16.

Big Planters

The nation's forest industries planted about 240 million seedlings on their lands last year to insure plenty of timber for tomorrow's demands.

Nikola Tesla Honored By World Electricians

Nikola Tesla, the famed inventor whose 100th birthday is being celebrated this year by electrical organizations in this country and abroad, will be honored at the Fall General Meeting of the American Institute of Electrical Engineers in the Morrison Hotel in Chicago, Oct. 1-5, according to an announcement of W. M. Ballenger, MWSE, meeting chairman.

One of the highlights of the honors to be paid to the inventor of the alternating current motor which contributed to the electrical age, will be a demonstration-type lecture by Dr. Samuel G. Hibben commemorating Dr. Tesla's contributions to the electrical industry and to the world. Dr. Hibben, former director of applied lighting, Lamp Division, Westinghouse Electric Corp., is now with Holophane Co. The demonstration will consist of spectacular high-voltage and illumination demonstrations. Dr. Hibben's address will be devoted to aspects of Tesla's work which relates to high-frequency studies connected with radiation or luminous phenomena.

Fifty-four technical sessions are scheduled, covering the electrical industry as broadly as possible, from electronics to developments in generation of massive blocks of electrical power. All six technical divisions of the institute, Communications, General Applications, Industry, Power, Science and Electronics, and Instrumentation, will hold symposiums and sessions on developments in their fields.

The Committee on Management is planning a panel discussion by several

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young graduate engineers who work and were trained in the Chicago area. They will discuss their preparation for their work and the training they have received on the job, and opportunities presented to them.

Those attending the meeting also have been invited to the 12th Annual Electronics Conference, Oct. 1-3 in the Sherman Hotel.

In addition to the technical sessions and other events scheduled at the AIEE meeting, inspection trips are planned to Acme Steel Co., Ridgeland Station of Commonwealth Edison Co., Zenith Radio Co., Swift & Co., WNBQ, the new Prudential Insurance Company building, Kellogg Switchboard Co., and International Business Machines office.

Assisting Ballenger are the following committee chairmen: G. L. Welch, MWSE, vice-chairman; E. F. Koncel, Jr., MWSE, secretary; F. M. Scott, MWSE, treasurer; M. J. Adams, special activities; D. H. Beal, Fall Frolics; J. F. Bracken, hospitality; B. T. Carmody, hotel arrangements; E. H. Finch, finance and budget; D. F. Hayworth, sale of technical papers; C. F. Hill, technical program and monitors; Mrs. F. A. Larson, ladies; D. L. Levine, registration; H. E. Nason, trips and transportation; J. A. Romano, MWSE, general session, and J. T. Tyner, publicity.

Piggy-back Pavers

Piggy-back truck-trains were used to pave a rail yard, reports *Construction Methods and Equipment*. A Pittsburgh firm used three transit-mix trucks, perched on top of a supply train, to dump concrete ahead of a finishing machine for a railroad paving job.

Brass Powder May Advance Metallurgy

A brass powder has been developed that may give a boost to the field of powder metallurgy.

That's the report from metallurgists of the New Jersey Zinz Co., Palmerton, Pa., and Armour Research Foundation of Illinois Institute of Technology, Chicago, who collaborated on the project.

"Gains in strength and hardness brings brass powder metallurgy parts closely in line with properties of wrought metal parts," said Robert Lubker, manager of ARF's metals research department.

Working under a contract with New Jersey Zinc, Armour metallurgists tested about 100 combinations in their search for alloys for powder metallurgy applications that had desirable age hardenability characteristics.

Robert F. Domagala, associate metallurgists and project leader, said the metals scientists had their sights on these three primary goals:

1. To find an alloy sufficiently hard enough for barrel finishing. (Many metals become dented when subjected to the barrel finishing process.)

2. To find an alloy that could compete in hardness and strength with wrought metal products.

3. To obtain high hardness for new fields of powder metallurgy applications.

"We found several alloys that satisfy these requirements very well," Domagala declared.

Powder metallurgy is employed to produce materials that are difficult to manufacture by other techniques. In the most conventional method of metal production the alloy is melted and then poured into a mold. In powder metallurgy the powder is compacted into a mold, removed and then sintered (heated) to cause bonding.

Powder metallurgy often is used in the production of intricate metal parts, Domagala said, because the materials produced by this method require little additional machining. This gives it a decided cost advantage over most other metals techniques.

The alloys developed at ARF were tested thoroughly for age-hardenability —which increases the hardness of the metal in a given time at a given temperature. Several alloys were developed that reacted favorably to these tests.

Many commercial products are age-hardenable, Domagala pointed out, but few that are manufactured in the powder metallurgy process.

Third International Automation Exposition Set for Nov. 26-30

New York City will become the center of attraction to all engineers and executives interested in plant and office automation when the Third International Automation Exposition is held at the New York Trade Show Building from Nov. 26 to 30.

Products on display will include all equipment and components necessary to "automate" any process in office or plant—from automatic assembly, handling and data processing equipment, to subminiature relays and switches.

In addition to the products displayed by 180 exhibiting manufacturers, the show will feature 60 lecture-demonstration clinics on computers, process automation, machine automation, servomechanisms, electromechanical and electronic components sponsored by the Show management each morning from 9 to 12:30.

A two-day "Senior Officer Conference on Office Automation" directed by Gordon L. Mattson and sponsored by Fordham University School of Business will be held in cooperation with the exhibition at the New Yorker Hotel. Dr. Douglas Courtney will direct a two-day conference on Human Engineering and Automation co-sponsored by the Manhattan College School of Engineering.

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538 MW CHIEF ENGR. EE 44, 20 yrs. in des. of contractors, starter magnetic switches, auto. control for ind. machines. 13 of which were in power plant des. substations control protection-mfrs. specs. & prints, wiring diagram-schematics, supv. drafting squad. $10,000 East-Midwest.

CRERAR LIBRARY
News and Notes

Engineers and other technical workers who use Crerar services appear not to let down during the Summer months, if use of the Library's photocopying services is a good measure of their activity. During June and July of 1956 there was an increase in photostat service of more than fourteen percent over the same period in 1955. Photostats were produced at an annual rate of 100,000 exposures. Microfilm orders normally run substantially lower than for photostats, but in the first six months of 1956, there was an increase in this service of more than 25%, many orders coming from other countries, including India, Japan, Germany, England, Hungary and some of the countries in South America.

* * *

A project involving a survey of the subject catalogs of Crerar Library has just culminated in a book which should be of interest to industrial and engineering libraries. *The Classified Catalog; Basic Principles and Practices* has just been published by the American Library Association in Chicago. Authored by Dr. Jesse H. Shera and Miss Margaret Egan of Western Reserve University, and two members of Crerar's cataloging staff, the book presents the principles and rules upon which the classified subject catalog should be constructed. The studies out of which the book grew, and the editorial costs of its production, were financed by a grant to Crerar Library from the Rockefeller Foundation.

* * *

The ingenuity of early mechanics and physicists in inventing and manufacturing time pieces is shown by an exhibit *On Telling Time* which will remain in the main floor lobby of the Library through mid-September. Rare books from the Library's extensive collection on horology are supplemented by rare clocks and clock mechanisms from personal collections lent by members of the Midwest Chapter, National Association of Watch and Clock Collectors. Of special interest are the examples of the craftsmanship of early American clock makers. Such famed names as Eli Terry and his son Silas B. Terry and Seth Thomas are represented in the exhibit.

Research Group Engaged by Kennecott

Horizons Incorporated, Cleveland industrial research organization, has been engaged by the Kennecott Copper Company of New York, as consultants in the design, erection and operation of a pilot plant to produce zirconium in the Cleveland area.

The work results from a contract between Kennecott and the Horizons' affiliate, the Horizons Titanium Company of New York, the exclusive licensee of a number of patents covering the metallurgy of zirconium and other metals as originally developed by Horizons Incorporated.

The pilot plant marks the first non-government sponsored piloting of this critically important nuclear metal. While it is understood that a substantial sum is involved in the project, the exact figure was not released. The facilities will be located on property leased from the Ferro Corporation in the Cleveland suburb of Bedford.

Horizons Incorporated is nationally recognized as a pioneer in the electrolytic production of zirconium, titanium and similar metals currently so important in the atomic energy program.

Only recently Horizons was awarded a $200,000 development contract by the Navy Bureau of Aeronautics for further exploration of these electrolytic processes as applied specifically to titanium, vital in the military aircraft industry.

Dr. Harry Durney, Kennecott's resident engineer has already been assigned by the company from New York to begin liaison work with Horizons in Cleveland in connection with the design of the plant. He will have offices at the Horizons' laboratory.

New Bonus Plan

A brand new stockless stock bonus plan has been set up for young executives by a Pittsburgh firm, reports *Factory Management and Maintenance*. Salaried employees who make a measurable contribution to the success of the company may be given "units" representing shares of the firm's stock. They're not stock but have most of the characteristics of stock except voting rights. When the employee retires, dies or leaves the firm he or his beneficiary will receive "dividends" earned by his accumulated units—the equivalent of the dividends actually earned by company stock.

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Reviews of Technical Books

Engineering Mechanics

Engineering Mechanics, by S. Timoshenko and D. H. Young, McGraw-Hill Book Company Inc., New York 16, N. Y. Fourth edition, 1956. 478 pages. Price $7.50.

This comprehensive text for the undergraduate in engineering stresses the importance of mastering the fundamental principles of mechanics in order to build a firm foundation for later specialization. With this in mind, the authors try to acquaint the student with as many general methods of attack as possible; to illustrate the application of these methods to practical engineering problems; but to avoid routine drill in the manipulation of standardized methods of solution.

Timoshenko and Young, in this fourth edition, have completely revised the material that appeared in their *Engineering Mechanics* (1937), *Theory of Structures*, and *Advanced Dynamics*. They have simplified the text proper, improved the arrangements of subject matter, and less importance is given the algebraic treatment of problems. Now, almost all problems are given with numerical data and numerical answers.

But, as in previous editions, the authors' presentation is thorough and complete, well-written in a clear, concise manner, and arranged systematically. Much of the statics portion has been rewritten so that it will be easier to teach, and many phases of engineering topics have been up-dated and simplified.

S. Timoshenko is professor emeritus of engineering mechanics at Stanford University and D. H. Young is currently professor of engineering mechanics at Stanford University.

R.G.G.

Electronics and Electron Devices

Electronics and Electron Devices, by Arthur Lemuel Albert, The Macmillan Company, New York 11, N. Y. Third edition, 1956. 582 pages. Price $8.00.

This is the third edition of the book that was formerly called, *Fundamental Electronics and Vacuum Tubes*. With the introduction of transistors in 1948, important changes were brought about in electronics. So semiconductor theory and the principles of semiconductor devices are presented in this text for the undergraduate students in electrical engineering.

Albert gives special attention to the study of the fundamentals of electronics, the application of electronic principles to electronic devices, and the use of these devices in electric circuits.

But this new edition, modified, practically rewritten, and descriptive material eliminated in favor of new material, retains the three main objectives of previous editions. It provides a textbook for junior and senior courses on basic electronics and electron devices, it is well balanced between theory and illustrative applications, and it is suited to the needs of students interested in the power field as well as those who are looking forward to careers in communication and control.

An important chapter is the one on Magnetic Amplifiers; basic training in this important field is often overlooked, since these amplifiers are not electronic in the usual sense, but they are important in control and often supplement and at times supplant, electron devices. This chapter was written by J. J. Wittkopf, who is an outstanding teacher and engineer of experience in control applications.

A new chapter on Wave-shaping and Control Circuits, which covers differentiating, integrating, limiting, clipping, multivibrator, and similar circuits has been added.

R.G.G.

Cams

Cams Design, Dynamics, and Accuracy, by Harold A. Rothbart, John Wiley & Sons, Inc., New York 1, N. Y. 1956. 350 pages. Price $9.50.

This up to date approach to cam analysis, emphasizing the basic use of cams in computation, should prove valuable for the designer who is interested in contriving a mathematical function, motion, mechanism, machine, or mechanical computer. Mechanical engineering students and instructors will also find it most helpful.

Rothbart states that since the usual kinematic approach to cam action has been to include it only as part of the study of kinematics, he presents three relevant points, pertinent to the study of high-speed operation, heretofore not included in the subject. These are: the shape of the acceleration curve, which provides information on vibrations, noise, and wear; the flexibility and backlash that exist in most systems; and the accuracy of cam profile in terms of its effect on the performance of the mechanism.

These, as well as the explanations of many cam applications, will aid the machine designer especially interested in the growing field of high-speed machinery. Concrete suggestions referring to mass, acceleration, materials, and the type of cam and follower to be used are given. Profile accuracy and errors are discussed and mathematics is kept to a minimum.

Harold A. Rothbart has been an engineering draftsman, a machine designer, a marine engineer, an instructor at the Newark College of Engineering, and assistant head of research for the L. J. Wing Company. At present he is a member of the mechanical engineering department at The City College of New York, as well as a consulting engineer.

R.G.G.

Piasecki Gets V-L Plane Contract

A contract to design, ground and wind tunnel test a new vertical lift concept combining the versatility of the helicopter with the capabilities of high, level flight speed, has been awarded to Piasecki Aircraft Corporation by the Navy Department's Bureau of Aeronautics.

In the Navy's never-ending search for new designs for fleet operations and other uses, this contract is for the first phase in the development of a new aircraft configuration.

The Piasecki Corporation's design is a serious contender in the emerging new vertical lift field that is opening new horizons of flight and becoming increasingly important in the concept of future warfare.

It would not obsolete helicopters, but would extend the vertical take-off ability to other types of high speed aircraft.

Applicable to be operational from carriers, cruisers, beachheads and even destroyers, the proposed aircraft is designed to take off and land vertically in restricted space or an unprepared land area.

Rising vertically, the new aircraft is designed to hover, maneuver and fly backward like the helicopter. But here the similarity ends.

Once airborne, it flies like an airplane and rapidly attains high, level flight speed. Throughout its flight, including vertical take-off, it retains its horizontal attitude as does the conventional airplane.

With high load-lifting capabilities, the new VTOL aircraft is designed to carry loads greater distances than the helicopter because of its increased range efficiency. It can fly, glide and land safely under full control with one engine out or with complete plant failure. It can also be designed for taking off and landing on water.

Although designed for vertical take off and landing, the same aircraft can be operated as a short-run take off and and landing aircraft giving it further increased payload capacity.

The Piasecki contract marks the first announcement of an award by the Bureau of Aeronautics, Navy Department, for this type vertical lift concept that opens new horizons of aeronautical development.

To assure United States leadership in the increasingly important VTOL field, contracts were previously awarded by the Army, Air Force and the Office of Naval Research to other companies for vertical lift development. Among these, awards went to Bell, Fairchild, Hiller, Kaman, Lippisch and Ryan that range from the tilted wing and propeller type to the rotated jet type.

The Russians recently revealed a tail-sitting, jet interceptor VTOL.

The trend is toward vertical lift configurations for an increasingly wider use in the military field. This portends, probably, that the VTOL military designs will point the way to a new family of commercial aircraft.

Capable of vertical ascent and descent, plus its high speed, the PAC-design is adaptable to various sizes from the private type to the huge inter-city transport type.

The inherent advantages of steep gradient aircraft over helicopter are attracting the interest of commercial transport operators. They see in the steep-gradient aircraft the opportunity to achieve greater speed at lower initial and operating costs than the helicopter has provided up to now.

Its ability to take off restricted space adds to its allure as a promising answer for passenger air service for many communities now deprived of air transport because of the almost prohibitive cost of the huge, elaborate airports necessary for the conventional airplane.

The VTOL aircraft could also reduce the present critical airport traffic congestion. The large airports would then be limited to use by the jets and long-range transport traffic.

This contract is the third prime award from the Army and Navy recently announced by Piasecki Aircraft. Eight other prime contacts have been awarded the company but not yet released for publication. Numerous other PAC proposals are being evaluated by the armed forces at Washington and elsewhere.

Other contracts held by Piasecki include the original design of an unmanned, remotely controlled configuration named the "Sea Bat," also for the Navy's Bureau of Aeronautics. The fantastic "Sea Bat" has become a center of interest in shipboard circles since it can perform many missions that are impractical to helicopters or other existing type aircraft. It is one of the newest in the nation's so-called "push-button" arsenal of weapons.

The "Sea Bat" will be able to literally "hang in the air" and maneuver in any direction under complete electronic control.

In addition, the company also has a contract for designing, manufacturing and flight testing a radically new vibration-reducing, low-maintenance, low-cost helicopter rotor that will greatly reduce the cost of rotary wing aircraft. This is being developed under the cognizance of the U. S. Army Transportation Corps' Research and Development Command.

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— Poor Richard's Almanack

WSE Personals

Lynn J. Riege, MWSE, the Hapman-Dutton Company announces, has been appointed director of sales of the Hapman Conveyor Division.

Riege was associated with the United States Gypsum Company as manager materials handling engineering for the company's 52 plants and warehousing operations, in addition to handling materials-handling problems for their outlets.

He is a graduate of the Missouri School of Mines and Metallurgy with a B.S. degree in mechanical engineering. After graduating from school in 1940, Riege was a general foreman for Republic Steel Corporation for eight years in charge of maintenance, production and shipping. While on this position Riege was credited with developing one of the first clamping devices to be mounted on a fork lift truck to pick up a group of kegs. He was then a plant engineer for the Glidden Company for two years.

After becoming associated with the United States Gypsum Company in 1950, he held positions of materials handling engineer, engineer materials handling equipment and in addition, the company offered his consulting advice to the many thousands of building material dealers to mechanize their operations or plan a new operation. He was called upon to assist in conducting materials handling clinics for the National Retail Lumber Dealers Association expositions in New York (1954), Cleveland (1955), and Chicago (1956).

Lynn J. Riege

Riege has been a member of the Chicago Chapter of the American Material Handling Society and has served as treasurer, executive vice-president, president, and national director. He has served as public relations chairman for the national organization, and he was general chairman of the Materials Handling Conference held in Chicago in conjunction with the 6th National Materials Handling Show in May, 1955. Riege was the first to obtain a public officials proclamation proclaiming a "Better Materials Handling Week" which was in Chicago during the 6th National Materials Handling Show and was proclaimed by the mayor of Chicago.

He has presented talks to several AMHS chapters and other technical societies on the "Modular Unit Load Program and its Effect on Distribution Costs," and has written several articles that have been published in *Modern Materials Handling*. He also prepared an article on "Pallet Construction and Storage Aids" which was published in *Building Supply News* and republished in *Material Handling Digest*. The Department of Commerce, Technical Digest Service made a digest of the article and it was sent to each foreign country participating in their technical aid program to be published in the foreign translations.

Riege has recently been elected secretary of the national AMHS which is affiliated with material handling societies in England and Germany, and has also recently received a National Honor Award for his "Service to Technical and National Society Progress" which is a merit of distinction for those in the materials handling profession.

Mr. Riege, besides being a member of the Western Society of Engineers, is a member of the Standardization of Pallets Committee, and is presently listed in *Who's Who in Engineering*.

* * *

George I. Uitti, MWSE, is the new president of the Michigan College of Mining and Technology Association, and was installed at the Tech Reunion in Houghton, Mich. on Aug. 9.

He was graduated from Tech in 1925 with B.S. and E.M. degrees and received his M.S. degree from Illinois Institute of Technology in 1939.

He is president and structural engineer of Thomas J. Higgins Associates, Inc., 228 North LaSalle Street, Chicago, who have designed and built over 50 school buildings in the Chicago area.

* * *

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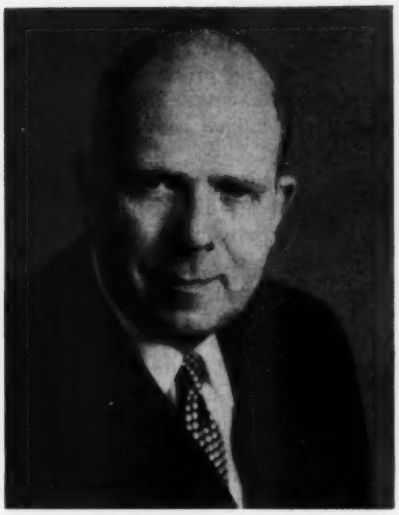

William L. Everitt

William L. Everitt, MWSE, dean of the College of Engineering at the University of Illinois, is the new president of the American Society for Engineering Education.

Everitt, a distinguished electrical engineer and educator, was named by a unanimous vote of nearly 1100 members of the society attending its 64th annual meeting at the Iowa State College at Ames.

The Society's new treasurer is John Gammell, director of graduate training at the Allis-Chalmers Manufacturing Company, Milwaukee.

Everitt, who has been a member of A.S.E.E. since 1927, was its vice president for two years in 1953-55. He has been a leader in its efforts to increase the basic science content of engineering curricula and is now chairman of a committee to implement the society's recommendations in this area.

A graduate of Cornell University, Everitt holds advanced degrees from the University of Michigan and Ohio State University. He joined the electrical engineering faculty at Ohio State in 1926 and left there in 1944 to become head of the Department of Electrical Engineering at the University of Illinois. He became dean of the Illinois College of Engineering and director of its Engineering Experiment Station in 1949.

Everitt's wide professional activities have included service on various committees and panels of the Department of Defense, the National Science Foundation, the Fulbright Award Committee of the National Academy of Science, the National Bureau of Standards, and Engineers' Council for Professional Development.

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Dividends Paid by Scientific Research

Scientific research is beginning to pay dividends in Burma.

This is the opinion of Dr. Christopher E. Barthel, Jr., assistant director of Armour Research Foundation of Illinois Institute of Technology, Chicago.

Barthel has returned to the U. S. after serving as director-general of the Union of Burma Applied Research Institute since 1953 when the Foundation undertook reorganization and expansion of the Burmese Institute's long-range research and development program and the formation of its present staff.

"Results of the program are starting to show effects on the economy of Burma," Barthel said.

Armour Research Foundation scientists have demonstrated to the government of Burma the value of scientific research for the development of the country, according to Barthel.

A firm foundation for continued growth of scientific and engineering research has been established in Burma, he said, through legislation initiated by the ARF staff.

Primarily a one-product nation, Burma's economy has depended principally on the sale of rice as a cereal grain.

"Since the research program was established at the Institute," Barthel pointed out, "new rice products and industrial ceramic wares have been developed. A study also is under way to determine the feasibility of producing radioactive minerals for export."

Greatest progress has been made in the development of Burma's rice products program, Barthel reported.

"High quality rice starch and bran oil have been developed," he said, "and the government is now in the process of erecting an oil producing plant."

Rice starch can be used for most things for which corn starch is used, he explained. These things include textile and paper sizing, cosmetics, and pharmaceutical products.

"Because it is a whiter and finer grained product," Barthel said, "rice starch has certain applications that make it preferable to corn starch."

Burma also is producing ceramic wares in production quantities as a result of studies by the Institute.

An Old Art Gets New Technique

The newest technique in one of the oldest of arts — ceramics — may enable man to travel to the moon.

It's called "Flame Ceramics," a novel method of coating metals and other substances with ceramic materials.

The process was developed at Armour Research Foundation of Illinois Institute of Technology.

Most known metals are unable to withstand the extreme surface heat generated by the awesome speeds of rockets and missiles. That's where ceramics enter the picture.

Through the flame spray technique it is possible to cover rockets and missiles with a coating that will protect the undercoat from high temperatures.

"In many cases, the underlying metal actually can be melted without causing coating failure," according to S. W. Bradstreet, supervisor of the chemistry of mineral products in the Foundation's ceramics and minerals research department.

Flame Ceramics is an offspring of "Solutions Ceramics," an earlier Foundation development. In Flame Ceramics, the particle is sintered as it is fed through a flame; in Solutions Ceramics the ceramic material is applied as a hot liquid.

The coatings have a remarkable resistance to heat, abrasion, and chemical attack, Bradstreet said. Most coatings can be used for electrical insulation; one even will conduct electricity.

The ceramic coating is extremely effective for protecting metals, like steel and aluminum, against high temperature erosion such as encountered in rocket nozzles. And the hardness of the coating suggests its use in protecting softer metals from wear.

Besides its obvious applications to rockets and missiles, Flame Ceramics already has shown its value in these adaptations:

—Anti-heat protection for aircraft parts.
—Coating for flame equipment.
—Thermal protection for engine parts.
—Increasing wear and skid resistance of metal treads.

Continental Coatings Corp., 140 S. Dearborn St., Chicago, has been granted world-wide rights to this process and the right to sub-license Flame Ceramics materials and the processes involved.

One of the outstanding features of this new technique is its simplicity of application.

The sprayed composition is a powder usually composed of a single oxide, such as alumina or zirconia, with other necessary additives to give the desired coating. The powder is contained in a hopper and is blown through a flame torch.

Surfaces to be coated are sand or grit blasted. Non-metals do not have to be sandblasted, but should be cleaned thoroughly.

The material that is to be coated does not have to be heated excessively. Ordinary ceramic coatings, on the other hand, require heating of both the metal and the ceramic to high temperatures, Bradstreet explained.

Oxy-acetylene flames are feasible for the production of some coatings, he pointed out, but oxy-hydrogen is preferable in most cases.

"A great variety of coatings can be applied by the Flame Ceramic process," Bradstreet declared. "Their most useful properties are abrasion and wear resistance, high dielectric strength and resistivity, chemical inertness, thermal insulativeness, and high melting point.

"It also is possible to produce coatings which are electrically conductive, relatively flexible, or sealed to provide corrosion protection to the base material."

Bradstreet reported that the Flame Ceramic coatings can be impregnated with waxes, resins, silicones, colloidal suspensions, and other desired solutions. Silicone impregnations provide protection against acids at temperatures not over 450 degrees F., he said.

"Higher temperature protection can be obtained with inorganic impregnations," according to Bradstreet. "The temperature to which coatings impregnated with inorganic materials can be used depends on the expansion characteristics of the base materials."

A wide variety of physical, chemical, and electrical properties can be obtained by intermixture of many coating materials with metal, powder, cermet, glass fruits, or other mineral constituents. The type of coating applied depends, of course, upon the special task the material is to perform.

For example, the alumina coating is electrically insulative. Bradstreet anticipates its use in the manufacture of high temperature process equipment.

Although the Zirconia coating is somewhat softer and more difficult to apply than the alumina coating, its resistance to corrosion and heat is greater, Bradstreet stated.

Flame titania is said to be outstanding in its resistance to mechanical abrasion.

The adherence of the coating depends on the underlying metal, Bradstreet pointed out. In general, he said, the hard ferrous and aluminum alloys provide the best bonding.

Special coatings are available for the softer metals. Nickel alloys and titnaium are good bases for any of the coatings if not too thickly applied.

The thickness of the coatings can be increased indefinitely by continued applications. But for most applications a thickness of .010 is adequate.

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New York Plays Automation Capital

New York will be the automation capital of the world—for a week this coming November.

Mayor Wagner has officially proclaimed the week of Nov. 26-30, the week after Thanksgiving, as "Automation Week."

Lending substance to the spirited words of the proclamation is a varied lineup of events which will attract experts in automation from all parts of the world. Most important is the Third International Automation Exposition, to be held at the new Trade Show Building, 500 Eighth Avenue. It was the Second International Automation Exposition, held last year at Chicago's giant Navy Pier, that attracted Russian experts on mass production. The return visits of American automation experts led to a series of exchange invitations which has not yet run its course.

Apart from the International Automation Exposition, but sponsored by and coordinated with it, are conferences on "Automation for the Office" and on "Human Engineering for Automation." The former is co-sponsored by Fordham University School of Business and the latter co-sponsored by Manhattan College. A hundred "Clinics" in different aspects of automation, using exhibits at the exposition as demonstration material, are scheduled for "Automation Week." Capping the climax, the annual meeting of the American Society of Mechanical Engineers will convene the same week, attracting additional thousands.

IIT Scholarship Honors H. J. Tonn

A scholarship has been established at Illinois Institute of Technology, Chicago, in honor of Herman J. Tonn, cofounder and vice president of the Chicago Rivet and Machine Co., Bellwood, Ill.

The scholarship fund was set up by the Rivco Foundation, a philanthropic organization of the company.

Tonn, 400 Washington St., Elmhurst, Ill., helped organize the company shortly after the turn of the century, when he emigrated to this country from Germany. The company manufacturers tubular rivets and setting machines.

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Award Goes to Admiral Moreell

The John Fritz Medal Board of Award, representing four major national engineering organizations, has announced at its headquarters in New York City that its award of the Medal will be to Admiral Ben Moreell, of Pittsburgh, chairman of the board of Jones & Laughlin Steel Corp. and, in World War II, famed organizer and commander of the Navy's "Seabees."

The award is sponsored jointly by the American Society of Civil Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers, The American Society of Mechanical Engineers and the American Institute of Electrical Engineers. Presentation of the gold medal and certificate signifying the honor, will be made Oct. 17, in Pittsburgh during the national convention of the American Society of Civil Engineers. Admiral Moreell, a member of the society, holds its highest distinction, honorary membership.

The John Fritz Medal Board of Award, constituted of 16 representatives of the sponsors, four from each organization, voted the award to Admiral Moreell as a "distinguished engineer and noted officer; builder of Naval works in war, and in peace eminent industrialist and civic leader; devoted servant of church and country."

Previous Medalists have included Bell, Edison, Goethals, HMWSE, Orville Wright, Marconi, Sperry, Herbert Hoover, Sr., HMWSE, Pupin, Kettering, Bush, Lord Kelvin, Alfred Noble, Budd, HMWSE, Fairless and others.

The John Fritz Medal was established in 1902 and bestowed by friends and associafes in his honor on John Fritz of Bethlehem, Pa., one of America's great pioneers in the iron and steel industry and Honorary Member of several leading engineering societies. It is awarded annually for notable scientific or industrial achievement. The Award Board consist of the four most recent presidents of each of the four sponsoring engineering organizations and the honor is accounted one of the engineering profession's most notable recognitions.

The award goes to a man who has had a highly active and surpassingly distinguished career. Born in Salt Lake City, Ben Moreell was graduated from Washington University, St. Louis. There he captained the track team and played fullback on the football eleven. He was graduated in 1913 with the degree of bachelor of science in civil engineering. For four years he was design engineer and resident engineer on construction projects of the City of St. Louis. He entered the Navy in 1917 and was assigned to the Civil Engineer Corps as assistant to the public works officer at the New York Navy Yard. He became chief of the Bureau of Yards and Docks and chief of civil engineers of the Navy, a position he held through World War II until his appointment, late in 1945, as chief of the Material Division of the Office of the Assistant Secretary of the Navy to coordinate all material procurement of the Navy.

On Feb. 1, 1944, at the age of 51, Ben Moreell became the Navy's youngest Vice Admiral. On June 11, 1946, he became the first officer not a graduate of Annapolis, and also the first Staff Corps Officer of the Navy, to hold the four-star rank Admiral.

In World War II, Admiral Moreell organized the "Seabees," construction men trained in combat. By the end of the war he had directed a $10-billion construction program in building up the shore establishment needed to back up the fleet. During the war, the "Seabees" and civilian construction forces worked at more than 900 Naval bases and stations, including 300 advance bases.

In recognition of his work with the Navy, Admiral Moreell holds the Distinguished Service Medal with Gold Star, the Legion of Merit and other awards. He retired from the Navy Sept. 30, 1946, and was elected president of the Turner Construction Co., of New York. On Mar. 15, 1947, he became chairman of the board and president of Jones & Laughlin Steel Corp. He relinquished the office of president in 1952 and remains as chairman of the board and chief executive officer of the corporation.

While in the Navy in October, 1945, Admiral Moreell was placed in charge of 49 oil refineries and four pipelines which had been seized by the Federal Government as the result of a nation-wide strike of oil workers. In May, 1946, he was appointed deputy coal mines administrator. In that capacity he took charge of the operation and administration of the bituminous coal mines, which the Government had seized. Later he was coal mines administrator, designated by Secretary of the Interior Krug. Also in May, 1946, the secretary of war appointed him to a board of consulting engineers to advise on improvements to the Panama Canal to meet future commerce and defense needs.

Admiral Moreell is a distinguished authority on concrete and reinforced concrete. He has contributed notable technical papers on the design and construction of concrete structures and on cements, and has received several awards from engineering societies. He served as chairman of the Task Force on Water Resources and Power of the Second Hoover Commission.

The John Fritz Medal was established on Aug. 21, 1902, the 80th birthday of John Fritz, at a dinner given in his honor by professional associates and friends who desired, in creating the award, to perpetuate the memory of his achievements in industrial progress. Recipients have included:

Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas Alva Edison, Charles Talbot Porter, Alfred Noble, Sir William Henry White, Robert Woolston Hunt, John Edson Sweet, James Douglas, Elihu Thomson, Henry Marion Howe, J. Waldo Smith, George W. Goethals, Orville Wright, Sir Robert A. Hadfield, Charles Prosper, Eugene Schneider, Guglielmo Marconi, Ambrose Swasey, John F. Stevens, Edward Dean Adams, Elmer Ambrose Sperry, John Joseph Carty, Herbert Hoover, Ralph Modjeski, David Watson Taylor, Michael Idvorsky Pupin, Daniel Cowan Jackling, John Ripley Freeman, Frank Julian Sprague, William Frederick Durand, Arthur Newell Talbot, Paul Dyer Merica, Frank Baldwin Jewett, Clarence Floyd Hirshfield, Ralph Budd, Everett Lee DeGolyer, Willis Rodney Whitney, Charles Franklin Kettering, John Lucian Savage, Zay Jeffries, Lewis Warrington Chubb, Theodor Von Karman, Charles Metcalf Allen, Walter Hull Aldridge, Vannevar Bush, Ervin George Bailey, Benjamin Franklin Fairless, William Embry Wrather, Harry Alonzo Winne and Philip Sporn.

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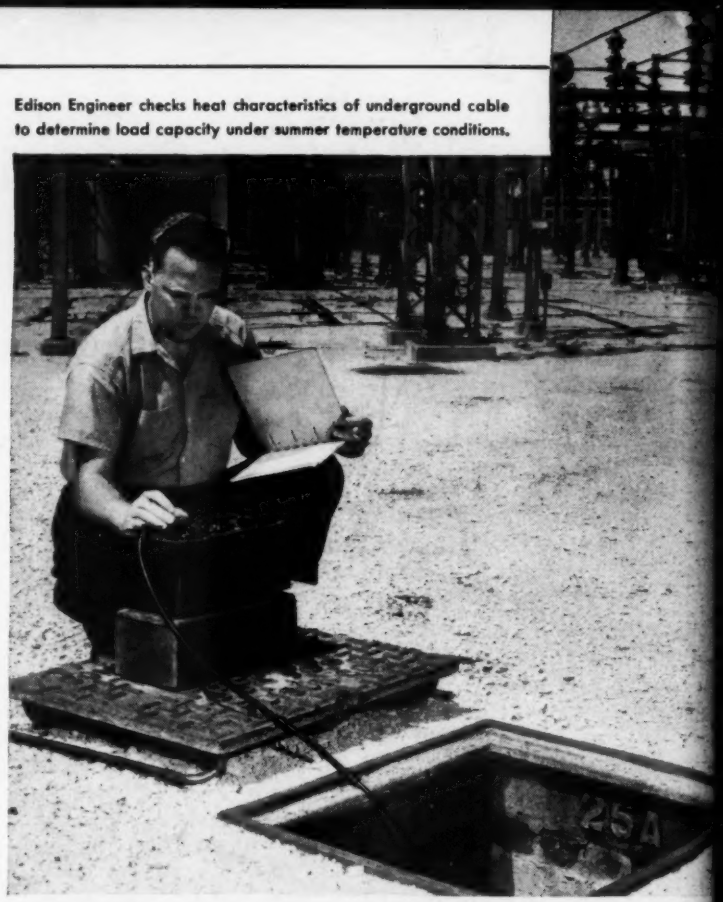

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Edison Engineers must determine cable's top electric load capacity under varied temperatures

It's an engineering fact that the larger the load on a cable, the hotter it gets. Our problem is to determine how large an electric load a cable can carry and still safely dissipate its heating loss so the cable temperature will not damage the insulation. Exceeding normal temperature limits decisively reduces the life of the cable.

It is a job of the Edison Engineer to make sure our cables have a long useful life. To do this he must constantly test for all of the many variable factors which contribute to the temperature of the cable, and carefully analyze all of the data. The factor which is contributing most to the high temperature can then be corrected. Even the ducts in which the cables are encased and the surrounding earth are important in this analysis.

This problem has been compounded in the last few years. Summer peak loads now exceed the previous winter's peak. This means that cables must work harder in the summer months although their ability to carry an electric load is about 10% less.

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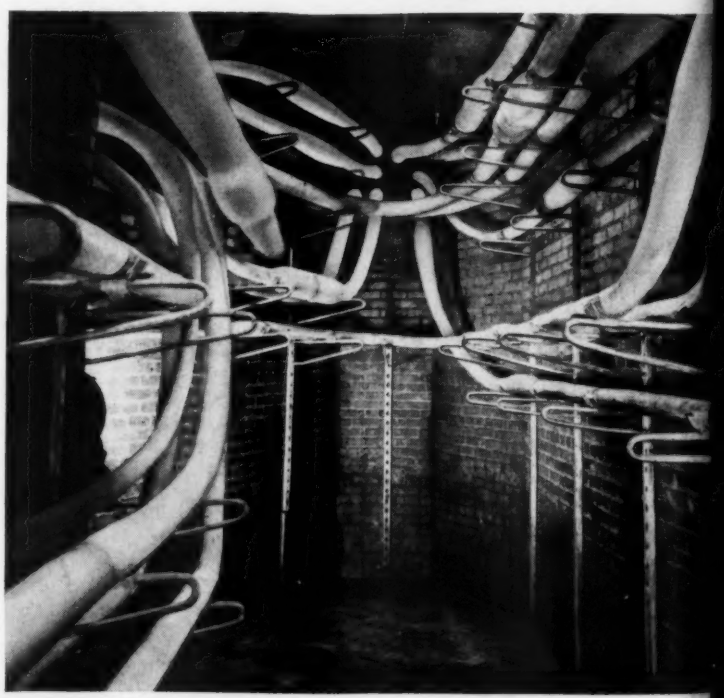

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